THE PROCEEDINGS OF THE PHYSICAL SOCIETY

FROM JANUARY 1943 TO NOVEMBER 1943

VOLUME 55

Published by
THE PHYSICAL SOCIETY
1 Lowther Gardens, Exhibition Road,
London S.W.7

Printed by
TAYLOR AND FRANCIS, LTD.,
Red Lion Court, Fleet Street, London E.C. 4

12311 OFFICERS AND COUNCIL, 1943-44

PRESIDENT

E. N. DA C. ANDRADE, Ph.D., D.Sc., F.R.S.

VICE-PRESIDENTS

who have filled the Office of President

Sir CHARLES V. BOYS, LL.D., F.R.S. (1916–18)
C. H. LEES, D.Sc., F.R.S. (1918–20)
Sir FRANK E. SMITH, G.C.B., G.B.E., D.Sc., LL.D., F.R.S. (1924–26)
Sir OWEN W. RICHARDSON, M.A., D.Sc., F.R.S. (1926–28)
W. H. ECCLES, D.Sc., M.I.E.E., F.R.S. (1928–30)
Sir ARTHUR S. EDDINGTON, O.M., M.A., D.Sc., LL.D., F.R.S. (1930–32)
A. O. RANKINE, O.B.E., D.Sc., F.R.S. (1932–34)
The Right Hon. LORD RAYLEIGH, M.A., Sc.D., LL.D., F.R.S. (1934–36)
T. SMITH, M.A., F.R.S. (1936–38)
ALLAN FERGUSON, M.A., D.Sc. (1938–41)
Sir CHARLES G. DARWIN, K.B.E., M.C., M.A., Sc.D., F.R.S. (1941–43)

VICE-PRESIDENTS

J. H. BRINKWORTH, D.Sc.
C. D. ELLIS, B.A., Ph.D., F.R.S.
H. T. FLINT, D.Sc., Ph.D.
N. F. MOTT, M.A., F.R.S.

HONORARY SECRETARIES

W. JEVONS, D.Sc., Ph.D. **(Business)**
J. H. AWBERY, B.A., B.Sc. **(Papers)**

HONORARY FOREIGN SECRETARY

Sir OWEN W. RICHARDSON, M.A., D.Sc., F.R.S.

HONORARY TREASURER

C. C. PATERSON, O.B.E., D.Sc., M.I.E.E., F.R.S.

HONORARY LIBRARIAN

L. C. MARTIN, D.Sc.

ORDINARY MEMBERS OF COUNCIL

Sir EDWARD V. APPLETON, K.C.B., M.A., D.Sc., LL.D., F.R.S.
Miss M. D. WALLER, Ph.D.
H. SHAW, D.Sc.
E. R. DAVIES, B.Sc.
W. B. MANN, Ph.D.
A. J. PHILPOT, O.B.E., M.A., B.Sc.
H. C. WEBSTER, M.Sc., Ph.D.
W. D. WRIGHT, D.Sc.
D. BRUNT, M.A., F.R.S.
B. CHALMERS, D.Sc., Ph.D.
B. F. J. SCHONLAND, O.B.E., M.A., Ph.D., F.R.S.
W. S. STILES, D.Sc., Ph.D.

EDITORS

Proceedings
J. H. AWBERY, B.A., B.Sc.

Reports on Progress in Physics
W. B. MANN, Ph.D.

COLOUR GROUP

Chairman
J. GUILD, A.R.C.S., D.I.C., F.Inst.P.

Honorary Secretary
H. D. MURRAY, M.A.

OPTICAL GROUP

Chairman
A. O. RANKINE, O.B.E., D.Sc., F.R.S.

Honorary Secretary
L. C. MARTIN, D.Sc.

CONTENTS

Part 1. 1 *January* 1943

PAGE

G. S. J. White. T. Vickerstaff and E. Waters. The physical significance of the dyer's system of colour matching 1

E. W. H. Selwyn. A sensitive method of adjusting lenses to cameras 15

M. Pirani. Conditions favouring the start of an arc discharge between cold activated electrodes at 50 cycles per second 24

R. Fürth. A new type of microphotometer 34

R. S. Vincent. The viscosity tonometer—A new method of measuring tension in liquids 41

E. G. Richardson. Turbidity measurement by optical means 48

E. J. Atkinson. The determination of the coefficient of kinetic friction 63

R. F. S. Hearmon. The significance of coupling between shear and extension in the elastic behaviour of wood and plywood 67

Recent reports and catalogues 80

Part 2. 1 *March* 1943

G. F. G. Knipe and J. B. Reid. A photo-electric tricolorimeter 81

F. J. Kerr. Refractive indices of gases at high radio frequencies 92

Norman Campbell. A demonstration of independent measurement 98

F. Twyman. Demonstration of the interferometer in lens and prism manufacture . 102

L. C. Martin. The theory of the microscope : III, Boundary waves in dark-ground illumination 104

H. H. Hopkins. The Airy disc formula for systems of high relative aperture . . 116

E. N. da C. Andrade. Newton (Newton Tercentenary Lecture) 129

Alfred Sommer. Photo-electric alloys of alkali metals 145

Reviews of books 155

Recent reports and catalogues 160

Part 3. 1 *May* 1943

H. R. Robinson. Rutherford : Life and work to the year 1919, with personal reminiscences of the Manchester period (1st Rutherford Memorial Lecture) . 161

R. J. Bracey. A multi-purpose collimator 182

L. F. Bates and D. R. Healey. The adiabatic temperature changes accompanying the magnetization of iron in low and moderate flow 188

J. H. Awbery. A problem in two-dimensional flow 202

Norman Campbell. The measurement of dynamical magnitudes 204

T. Smith. Note on image formation by rotating mirrors 210

E. F. Herroun and A. F. Hallimond. Laboratory experiments on the magnetization of rocks 214

Valdimir Vand. A theory of the irreversible electrical resistance changes of metallic films evaporated in vacuum 222

PAGE

Discussion on paper by E. G. RICHARDSON (*Proc. Phys. Soc.* **55**, 48 (1943)) . . 246
Corrigenda. Newton, by E. N. DA C. ANDRADE 247
Obituary notices :
Sir JOSEPH LARMOR 248
JOHN HAMER SUTCLIFFE 250
CHARLES ROBERT DARLING 251
NICHOLAS EUMORFOPOULOS 252
Reviews of books 254
Recent reports and catalogues 256

Part 4. 1 *July* 1943

J. W. PERRY. Thermal effects upon the performance of lens systems 257
E. W. H. SELWYN. The limit of visual resolution 286
B. K. JOHNSON. Recent optical materials and their possible applications . . 291
W. G. WEARMOUTH. Plastics and the optical industry 301
H. H. EMSLEY. Plastic spectacle lenses 314
Discussion : The resolution of optical images 321
G. N. PATCHETT. An application of the cathode-ray oscillograph to the measurement of the wave-length of sound 324
R. F. BARROW and E. E. VAGO. The band spectrum of SnSe in emission . . 326
H. T. FLINT and L. PINCHERLE. The impedance of hollow wave guides . . . 329
E. F. HERROUN. A comparison of the magnetic properties of solid and powdered magnetites : with observations on coercive force 338
Reviews of books 344
Recent reports and catalogues 344

Part 5. 1 *September* 1943

L. R. G. TRELOAR. The statistical length of paraffin molecules 345
Instructor-Captain T. Y. BAKER. Ray tracing through non-spherical surfaces . . 361
J. W. STRANGE. The chemical and physical properties of luminiscent materials . 364
F. W. COPPIN. "Kodak" fluorescence process of automatic colour correction. . 371
R. S. VINCENT and G. H. SIMMONDS. Examination of the Berthelot method of measuring tension in liquids 376
H. KOLSKY and A. C. SHEARMAN. Photo-elastic investigations of structural changes in plastic materials 383
N. R. TAWDE and V. S. PATANKAR. Experimental study of the intensity theories in band spectra : I, Hutchisson's theory ; II, Langstroth's theory 396
Discussion on paper by D. S. EVANS and K. MENDELSSOHN 410
F. C. BARTLETT. Current problems in visual function and visual perception (13th Thomas Young Oration) 417
E. N. DA C. ANDRADE. Newton's verses 426
M. A. EL-SHERBINI and Y. L. YOUSEF. A note on a compensated hot-wire air thermometer 427
M. A. EL-SHERBINI and Y. L. YOUSEF. A note on a simple baretter 428
B. SUGARMAN. The ultra-violet absorption spectrum of formic acid 429
Reviews of books 430
Corrigendum 432

Part 6. 1 *November* 1943

PAGE

C. R. Burch. On aspheric anastigmatic systems 433

B. F. J. Schonland. Thunderstorms and their electrical effects (2nd Charles Chree Address) 445

E. T. Whittaker. Chance, freewill and necessity in the scientific conception of the universe (27th Guthrie Lecture) 459

Sir Charles V. Boys. An elliptograph : with supplement on the evolute of the ellipse and the elastica 471

Discussion : The designing of non-spherical surfaces 481

Obituary notices :

Frank Forster Renwick 496

Baron Hirst of Witton 497

Leonard Darwin 498

Arthur Laidlaw Selby 499

Alexander Russell 500

Robert William Paul 502

Rollo Appleyard 505

Thomas Bernard Vinycomb 507

Harold Dennis Taylor 508

Francis John Welsh Whipple 511

Pieter Zeeman 513

Reviews of books 514

Corrigendum 516

Index to Volume 55 517

Index to reviews of books 522

Portrait of Sir Charles G. Darwin (President 1941–43) . . *frontispiece to Vol.* 55

PROCEEDINGS AT THE MEETINGS OF THE PHYSICAL SOCIETY

SESSION 1942–43

11 *September* 1942

The ninth meeting of THE COLOUR GROUP. At the Imperial College, London S.W. 7, Dr. W. D. Wright being in the Chair.

A lecture on "The teaching of colour in schools" was delivered by E. G. Savage, C.B., B.A., and was followed by an informal discussion.

A paper on "A photoelectric tricolorimeter", by G. F. G. Knipe, B.Sc., and J. B. Reid, B.Sc., was read and discussed.

---

18 *September* 1942

The fourth meeting of THE OPTICAL GROUP. At the Imperial College, London S.W. 7, Mr. T. Smith, Past President, being in the Chair.

The following papers were read and discussed:

"On aspheric anastigmatic systems" (with demonstration), by C. R. Burch, B.A., Ph.D.

"Combinations of spherical lenses to replace non-spherical refracting surfaces", by J. L. Houghton.

---

2 *October* 1942

Annual General Meeting. At the Imperial College, London S.W. 7, the President, Sir Charles Darwin, being in the Chair.

The minutes of the previous Annual General Meeting were read and accepted as correct.

The reports of the Council and the Honorary Treasurer and the Annual Accounts for 1941 were adopted.

The Officers and Council and the Auditors for 1942–43 were elected.

Votes of thanks were accorded to the Rector and Governing Body of the Imperial College and the Director of the Science Museum for excellent accommodation at meetings, to the retiring Officers and Council, and to Professor A. F. C. Pollard for preparing the U.D.C. Index Slips for the *Proceedings*.

---

2 *October* 1942

Science Meeting. At the Imperial College, London S.W. 7, the President, Sir Charles Darwin, being in the Chair.

The following were elected to Fellowship: William Richard Bates, Shaun Maturin Cox, Leonti Planskoy, Neville Arthur Portman.

It was announced that the Council had elected the following to Student Membership: Mary Billbrough, Clement John Danby, Bernard Fishel, Betty Hunt, James Eric Nisbet, George Hall Pennington, Eric Robinson, Marian Shackleton.

A lecture on "Turbidity measurements by optical means" was delivered by E. G. Richardson, B.A., D.Sc., Ph.D., and was followed by an informal discussion.

---

6 *November* 1942

Science Meeting. At the Science Museum, London S.W. 7, the President, Sir Charles Darwin, being in the Chair.

The following were elected to Fellowship: The Hon. John Benson, William Bowen, Desmond Alan Bullock, Raymond Niblett Crooks, Robert William Ditchburn, Richard John Munson, Ronald John Trott, Ta-Hang Wang, Eric John Baxter Willey.

It was announced that the Council had elected the following to Student Membership: Ray M. Boorman, John Reginald Brough, Frank Eric Claytor, William George Clouter, A. H. Coppard, Patricia Elizabeth Ferguson, J. A. F. Gerrard, Miriam Gilbert, Glynn Bennett Jeffery, Joan Kelly, R. C. Lane, Ronalde Philip Le Blanc, Emlyn Howard Lloyd, Thomas R. Lomer, Geoffrey George Parfitt, George S. Parry, George Pearce, H. D. G. Piggott, Anthony Fred Doran Pott, John Sadler Roberts, Harry Verdon Stopes-Roe, Paul Thistleton, Alan Alfred Ware, Harold Edgar Wilkinson.

The first Rutherford Memorial Lecture was delivered by Professor H. R. Robinson, D.Sc., Ph.D., F.R.S., who took as his subject "Rutherford: life and work to the year 1919, with personal reminiscences of the Manchester period".

---

20 *November* 1942

Science Meeting. At the Imperial College, London S.W. 7, Mr. T. Smith, Past President, being in the Chair.

John Home Dickson, Frank Taylor Farmer and Kenneth Edmond Brian Jay were elected to Fellowship.

It was announced that the following had been elected to Student Membership: Peter Milton Barham, Basil Jeffrey Benzimra, Bruce Alexander Bilby, Donald Eustace Blackwell, J. B. S. Brabham, C. J. B. Bradish, Basil Hugh Briggs, W. H. Butters, Peter Crombie Calder, Douglas Chaplin, Kenneth Henry Clarke, Robert F. Crocombe, Robert Alan Croft, Edward Thomas Emms, John Gorham, Douglas Hardy, Roy G. B. Hine, Alfred Peter Henry Jennings, Eleanor M. Jones, James Tyldesley Kendall, Raymond Douglas Lowde, Donald Douglas McVicar, Clifford Charles Joseph Milner, Roy Morris, Donald Vernon Osborne, Charles Arthur Padgham, Dennis Pallant, Peter Llewellyn Pennington, Bernard John Perrett, Percy Charles Ruggles, W. E. Shackcloth, Ernst Helmut Sondheimer, T. A. J. Stocker, Dennis John Tarran, Harold A. Waters, Donald Whittaker, Geoffrey P. L. Williams and Leonard Wiseman.

A discussion was held on "Scientific films and their use in the teaching of physics", the opening paper, by W. Ashhurst, M.Sc., being illustrated by films of various types.

---

27 *November* 1942

The fifth meeting of THE OPTICAL GROUP. At the Imperial College, London S.W. 7, Dr. A. O. Rankine being in the Chair.

The following papers and exhibits dealing with *Optical materials other than glass* were read and discussed:

"Plastic spectacle lenses", by H. H. Emsley, B.Sc.

"Recent optical materials and their possible applications", by B. K. Johnson.

"Plastics and the optical industry", by W. G. Wearmouth, Ph.D.

A lecture on "The effects of grains in photographic materials" was delivered by E. W. H. Selwyn, B.Sc., and followed by an informal discussion.

---

4 *December* 1942

Science Meeting. At the Science Museum, London S.W. 7, the President, Sir Charles Darwin, being in the Chair.

The following were elected to Fellowship: Edward Gordon Butcher, John Anthony Chaldecott (transferred from Student Membership) and Donald George Marshall.

To mark the tercentenary of Newton's birth, a lecture on "Newton" was delivered by Professor E. N. da C. Andrade, Ph.D., D.Sc., F.R.S.

---

9 *December* 1942

Science Meeting. At the Cavendish Laboratory, Cambridge, Sir Arthur Eddington, Past President, being in the Chair.

Professor Andrade repeated the Newton Tercentenary Lecture.

---

11 *December* 1942

The tenth meeting of THE COLOUR GROUP. At the Lighting Service Bureau, Savoy Hill, London W.C. 2, Dr. W. D. Wright being in the Chair.

The following papers on *Fluorescent materials* were read and discussed:

"The chemical and physical properties of luminescent materials", by J. W. Strange, Ph.D.

"The Kodak fluorescence process of automatic colour correction", by F. W. Coppin.

"Commercially useful fluorescent substances", by H. G. Jenkins, M.Sc.

"The photometry and colorimetry of fluorescent lamps", by G. T. Winch.

---

22 *January* 1943

The sixth meeting of THE OPTICAL GROUP. At the Imperial College, London S.W. 7, Dr. A. O. Rankine being in the Chair.

The following papers on *The resolution of optical images* were read and discussed:

"The Airy disc formula for systems of high relative aperture", by H. H. Hopkins, B.Sc.

"Resolution in dark-ground illumination", by K. B. E. Merling.

"Resolution in photo-micrography", by J. Smiles.

"The theory of the microscope. III. Boundary waves in dark-ground illumination", by L. C. Martin, D.Sc.

---

19 *February* 1943

Science Meeting. At the Imperial College (City and Guilds College), London S.W. 7, the President, Sir Charles Darwin, being in the Chair.

Richard Christian Hawkes was elected to Fellowship.

Professor C. L. Fortescue gave an account of the war-time work of the Electrical Engineering Department of the College, with special reference to the course of instruction in Radio. Members of the staff and students of the Department exhibited the work in progress and gave demonstrations.

---

3 *March* 1943

The eleventh meeting of THE COLOUR GROUP. At the Science Museum, London S.W. 7, Dr. W. D. Wright being in the Chair.

A demonstration of "A Cellon portable colour matcher" was given by E. R. Wells, B.Sc.

A paper on "The significance and limitations of the C.I.E. standard observer tables", by J. Guild, was read and discussed.

The meeting was preceded by the third *Annual General Meeting of the Colour Group* for the presentation of the Honorary Secretary's statement for 1942–43 and the election of Officers and Committee for 1943–44.

---

9 *April* 1943

At the Imperial College, London S.W. 7, the President, Sir Charles Darwin, being in the Chair.

The following were elected to Fellowship, the first sixteen being transferred from Student Membership: Richard Frank Barrow, Clement John Danby, Hugh Alexander Dell, Douglas Hugh Everett, Harold Hutchinson, James Tyldesley Kendall, Graham

Frederick Komlosy, Hugh Russell Letham Lamont, John Watson Leech, Stanley Naylor, Bernard Edward Noltingk, Arthur Charles Reid, Bernard Walter Soole, Arthur Geoffrey Stainsby, John Lawrence Tearle, Stanley Gordon Tomlin, James Arthur Ankerson, John Edward Bowman, Herbert John Dunster, Werner Ehrenberg, Thomas Sidney England, Malcolm Charles Marsh, Violet Olive Shirtliffe, Dennis Edward Skelton, John Leslie Thompson.

It was announced that the following had been elected to Student Membership: Raymond K. Appleyard, B. H. Chirgwin, George Cowper, Duncan S. Davies, Brian Philip Day, Eric Foster, Lionel Gilbert, Leonard A. Green, Oliver Samuel Heavens, Christopher Guy Ardern Hill, J. J. Kipling, Henry Lawton, James William McHugo, Arthur H. Rowden, J. G. Schwenger, K. W. Sykes, Eva Edith Vago, Bernard Miles Wheatley, Garth Angus Wheatley, John Reginald Whitefield, Richard Wallace Whorlow.

The nineteenth Duddell Medal was presented to Dr. C. R. Burch in recognition of his work on high-vacuum equipment. The medallist delivered an Address entitled "A technologist looks at the future".

---

16 *April* 1943

The seventh meeting of THE OPTICAL GROUP. At the Imperial College, London S.W. 7, Dr. A. O. Rankine being in the Chair.

A paper on "The limit of visual resolution", by E. W. H. Selwyn, B.Sc., was read and discussed.

A discussion was held on "The designing of systems with non-spherical surfaces", the opening paper being by Instr.-Capt. T. Y. Baker, B.A., and further contributions by J. H. Jeffree, E. H. Linfoot, L. C. Martin and T. Smith.

The meeting was preceded by the second *Annual General Meeting of the Optical Group* for the presentation of a report on the work of the first year and the election of Officers and Committee for 1943–44.

---

18 *May* 1943

Annual General Meeting. At the Royal Institution, Albemarle Street, London W. 1, the retiring President, Sir Charles Darwin, being in the Chair.

The minutes of the previous Annual General Meeting were read and accepted as correct.

The reports of the Council and the Honorary Treasurer and the Annual Accounts for 1942 were adopted.

The Officers and Council and the Auditors for 1943–44 were elected.

Votes of thanks were accorded to the Rector and Governing Body of the Imperial College, the Managers of the Royal Institution, the Director of the Science Museum, and the Electric Lamp Manufacturers' Association for excellent accommodation at meetings, to the retiring Officers and Council, and to Professor A. F. C. Pollard for preparing the U.D.C. Index Slips for the *Proceedings*.

The meeting was preceded by an *Extraordinary General Meeting* for the election of Professor Percy Williams Bridgman as an Honorary Fellow of the Society.

---

18 *May* 1943

Science Meeting. At the Royal Institution, Albemarle Street, London W. 1, the new President, Professor E. N. da C. Andrade, being in the Chair.

The following were elected to Fellowship, the first five being transferred from Student Membership: William Denis Hammond Blackman, Frank Eric Claytor, Wilfred Percy Fletcher, Douglas Edward Lewis, Brian Percival Mullins, William Ashhurst, Frank Kennedy-Newman, Arthur Henry Lee.

The twenty-seventh Guthrie Lecture was delivered by Professor E. T. Whittaker, M.A., Sc.D., LL.D., F.R.S., who took as his subject "Chance, freewill and necessity in the scientific conception of the Universe".

---

4 *June* 1943

Science Meeting. At the Science Museum, London S.W. 7, the President, Prof. E. N. da C. Andrade, being in the Chair.

The following were elected to Fellowship : Nicholas Kemmer, Erich Ernst Schneider, Charles Frederick Sharman, Robert Street, Gordon B. B. M. Sutherland, Trevor Hugh Turney.

It was announced that the following had been elected to Student Membership : Eileen Nora Bullerwell, Alfred Ernest Kay, Kenneth Elmslie Munn and Patrick Lever Willmore.

The thirteenth Thomas Young Oration was delivered by Professor F. C. Bartlett, C.B.E , M.A., F.R.S., who took as his subject " Some current problems in visual functions and visual perception ".

---

18 *June* 1943

The eighth meeting of THE OPTICAL GROUP. At the Imperial College, London S.W. 7, Professor L. C. Martin being in the Chair.

A lecture on " Optical aids to teaching " was delivered by H. E. Dance.

There followed an exhibition and demonstration of new optical projection apparatus suitable for educational purposes.

---

16 *July* 1943

Science Meeting. At the Royal Institution, Albemarle Street, London W. 1, the President, Professor E. N. da C. Andrade, being in the Chair.

The following were elected to Fellowship : Victor Ivor Little, William Clifford Morgan (transferred from Student Membership), Rudolf Peierls, Guthrie Rae Petrie, George Dawson Preston, John Alan Richardson.

The second Charles Chree Medal and Prize were presented to Professor (now Brigadier) Basil F. J. Schonland, O.B.E., M.A., Ph.D., F.R.S., in recognition of his work on thunderstorms and the lightning stroke.

The Charles Chree Address on " Thunderstorms and their electrical effects " was delivered by Brigadier Schonland.

REPORT OF COUNCIL FOR THE YEAR ENDED 31 DECEMBER 1942

Presented at the Annual General Meeting, 18 *May* 1943

INTRODUCTORY AND GENERAL

The Council again has to report on a period of remarkable growth, activity and prosperity of the Society. The membership shows a greater increase in 1942 than in any previous year, with the single exception of 1932, when the Optical Society and the Physical Society of London combined to form the present Physical Society ; science meetings were held frequently and attended well ; the Colour and Optical Groups have been conspicuously successful and cordially supported ; the sales of the *Proceedings*, the *Reports on Progress in Physics* and the earlier special publications of the Society have been highly satisfactory ; and the financial position of the Society has further improved.

In December 1942 the Council, with the Councils of the Faraday Society, the Royal Meteorological Society and the British Institute of Radiology, gave to the Institute of Physics twelve months' notice of the termination of the existing scheme of reduced conjoint subscriptions ; this is to be replaced as from 1 January 1944 by a simplified scheme, details of which are still under discussion.

Jointly with the Science Masters' Association the Society has set up a Standing Committee for Co-ordination and Guidance in the Teaching of Physics in Schools, the first meeting of which was held on 12 August 1942. The Committee is to be so constituted that it may serve in a consultative capacity to all bodies and individuals concerned with the teaching of elementary physics. Typical of its functions may be : the making of recommendations on definitions, statements of laws, notation and conventions ; the discussion of general and special problems of laboratory equipment during and after the war ; and the discussion of syllabuses with examining bodies and with authors and publishers of text-books.

The President, Sir Charles Darwin, returned from America early in the year.

The Society's representatives on other Bodies were the same as in 1941.

In fulfilment of a condition of the Society's occupation of the upper two floors of 1 Lowther Gardens, Exhibition Road, London, S.W.7, fire-watching was undertaken throughout the year; the Council again records its thanks to Dr. and Mrs. W. Jevons for accepting responsibility for this, and to Dr. and Mrs. R. W. B. Stephens for relieving them in this duty.

MEETINGS

An Annual General Meeting was held at the Imperial College on 2 October 1942 for the presentation of the 1941 Reports of the Council and the Honorary Treasurer and for the election of the Officers and Council for 1942–43.

Thirteen Science Meetings were held during the year : six at the Imperial College, three at the Science Museum, two at the Cavendish Laboratory, Cambridge, one at Rugby School and one at the Lighting Service Bureau of the Electric Lamp Manufacturers' Association. The war-time series of " lecture-surveys " and discussions was continued by Dr. Kathleen Lonsdale on " X-ray Study of Crystal Dynamics " (in London and again, with modifications, at Cambridge), by Professor W. V. Mayneord on " Measurement of Radiation for Medical Purposes ", and by Dr. E. G. Richardson on " Turbidity Measurements by Optical Means " ; these three lecture-surveys have been published in the *Proceedings* (**54,** 314 and 405 (1942), and **55,** 48 (1943)). Three of the meetings were held jointly with other bodies, namely, with the Cambridge Philosophical Society for the repetition of Mrs. Lonsdale's lecture, with the Royal Meteorological Society for a discussion on " Emission and Absorption of Radiation in the Atmosphere ", and with the Science Masters' Association for a discussion on " Some Aspects of the Teaching of Physics in Schools ". One meeting was devoted to a demonstration and discussion of " Scientific Films and their Use in the Teaching of Physics ", and one (of the kind that was usual

before the war) to the reading of papers and a demonstration. The attendances were satisfactory at most of the ordinary meetings and very large at the meetings for the special lectures reported in the following paragraphs.

GUTHRIE LECTURE

The twenty-sixth Guthrie Lecture was delivered on 20 March 1942 at the Science Museum by Sir Edward V. Appleton, who took as his subject " Ionospheric Influences on Geomagnetism ".

RUTHERFORD MEMORIAL LECTURE

The first Rutherford Memorial Lecture was delivered by Professor H. R. Robinson at the Science Museum on 6 November 1942, the title of the lecture being " Rutherford : Life and Work to the Year 1919, with Personal Recollections of the Manchester Period " (*Proceedings*, **55**, 161 (1943)).

NEWTON TERCENTENARY LECTURE

In celebration of the tercentenary of Newton's birth a lecture entitled " Newton " was delivered by Professor E. N. da C. Andrade at the Science Museum on 4 December 1942 and at the Cavendish Laboratory on 9 December 1942 (*Proceedings*, **55**, 129 (1943)).

DUDDELL MEDAL

The speeches delivered by Viscount Halifax and Dr. Coolidge at the presentation of the eighteenth Duddell Medal at Baltimore on 1 May 1942 have been published in the *Proceedings* (**54**, 527 (1942)).

The Council awarded the nineteenth Duddell Medal to Dr. C. R. Burch in recognition of his work on high-vacuum equipment. The presentation of the Medal, which could not be made at a Science Meeting in 1942, was deferred until 9 April 1943.

PROCEEDINGS

Volume **54** (1942) of the *Proceedings* has been published in the usual six two-monthly parts, but as was foreseen at the time of preparation of Council's Report for 1941, it is considerably smaller than either of the earlier war-time volumes, on account of the present limitation in the quantities of printing paper licensed by the Paper Control of the Ministry of Supply. In compliance with Paper Control regulations less space was devoted to advertisements in Volume **54** than in Volume **53** (1941).

Losses at sea, occasionally affecting relatively large consignments, and increased circulation both to the growing membership and to subscribers outside the Society, have together resulted in a shortage of stock of the first three Parts of the 1942 volume of the *Proceedings*. The Council therefore appealed to members of the Society to return copies no longer required by them, and is grateful to those members who generously responded to the appeal. The Officers and Council have decided that, when the supply of paper allows, those Parts of which stocks have become exhausted or very low shall be reprinted and a larger number of future issues shall be printed.

REPORTS ON PROGRESS IN PHYSICS

The sales of Volume **8** (1941) of the *Reports*, which was published in April 1942, have been highly satisfactory, as also have those of all the earlier volumes that are still available, especially Volume **7** (1940). There is still a considerable demand for copies of Volumes **1** (1934), **2** (1935) and **4** (1937), which have been out of print for several years. The sales of the *Reports* in the United States of America have continued to increase, and the Council again records its thanks to Miss Mitchell, Publications Manager of the American Institute of Physics, for her very kind and effective help in making our *Reports* easily available to American physicists by direct supply from the New York office of the Institute.

The demand for the whole series is expected to increase at the end of the war, and it is to be regretted that the supply of paper has not permitted the printing of larger editions or the reprinting of the earlier volumes. In view of the present restrictions it has been decided that all the paper allowed for the *Reports* in 1942 and 1943 shall be used for a single volume (Volume 9, already in active preparation) covering the two years instead of 1942 only. This course also effects an economy in the Society's stock of green binding cloth, which is now very difficult to obtain.

MEMBERSHIP

As the following table shows, the Fellowship increased in 1942 by nearly 5 per cent, and the Student Membership by about 37 per cent, making an increase of over 9 per cent in the total membership. The figure of 1247 at the end of December was by far the highest reached by the Society, and has been followed by a further increase up to the time of preparation of this Report. The numbers of newly elected Fellows, of Student Members transferred to Fellowship, and of newly elected Student Members were all larger than in any one year in the history of the Society.

Membership Roll (corrected figures)		Hon. Fellows	Hon. Fellows, Optical Society	Ex-officio Fellows	Fellows	Student Members	Total
Totals, 31 Dec. 1941		11	3	4	953	169	1140
Changes during 1942	Elected				57	96	
	Transferred				20 } 77	20	
	Deceased	1			17		
	Resigned or lapsed				14 } 32	4 } 33	
	Suspended				1	9	
	Net increase	−1			45	63	107
Totals, 31 Dec. 1942		10	3	4	998	232	1247

OBITUARY

The Council records with regret the deaths of the following Fellows :—Mr. S. G. Barker, Mr. W. A. Benton, Sir William H. Bragg (Past President), Mr. L. K. Brata, Mr. C. R. Darling (Past Vice-President), Mr. N. Eumorfopoulos, Professor C. C. Farr, Mr. T. Harris, Sir Joseph Larmor, Sir Henry A. Miers, Mr. B. M. Neville, Professor Jean Perrin (Honorary Fellow), Mr. S. Rennie, Mr. J. Rheinberg, Professor A. L. Selby, Mr. J. H. Sutcliffe (Past President of the Optical Society) and Mr. F. P. Whitehead.

COLOUR GROUP

At the second Annual General Meeting of the Colour Group, which was held at the Imperial College on 11 February 1942, Dr. W. D. Wright was re-elected as Chairman, Mr. H. D. Murray as Honorary Secretary, and the Committee for 1942–43 was elected.

Five Science Meetings of the Group were held in 1942 : on 11 February at the Imperial College ; on 27 March at the Midland Hotel, Manchester ; on 27 May at the Royal Photographic Society ; on 11 September at the Imperial College ; and on 11 December at the Lighting Service Bureau of the Electric Lamp Manufacturers' Association. The average attendance was about 64. The titles of the lectures delivered and of the papers read and discussed at these meetings are set out, with the names of the authors, in the pages immediately preceding Council's Reports in the November 1942 and November 1943 issues of the *Proceedings*.

The Chairman's Address on "Research on Colour Physics at South Kensington" and four of the 1942 lectures and papers have already been, or shortly will be, published in the *Proceedings* (**54,** 303 (1942) ; **55,** 1, 81, 364 and 371 (1943)) ; one paper, with the ensuing discussion, has been published in the *Journal of the Oil and Colour Chemists' Association* (**25,** 227 (1942)) ; and brief accounts of a lecture on the Teaching of Colour in Schools and a discussion on Fluorescent Materials have appeared in *Nature* (**150,** 422 (1942) ; **151,** 73 (1943)).

The two sub-committees dealing with Colour Blindness in Industry and Colour Terminology have continued their work.

The membership of the Group on 31 December 1942 was as follows :

Members of the Physical Society	69
Members of other participating bodies	61
Members of six firms subscribing for sustaining membership	15
Other individual members	4
Total ..	149

OPTICAL GROUP

The Inaugural General Meeting of the Optical Group was held in the Science Museum on 6 March 1942, when a draft Constitution was discussed and adopted, and the Chairman (Dr. A. O. Rankine), Honorary Secretary (Prof. L. C. Martin) and Committee for 1942–43 were elected.

Five Science meetings of the Group were held in 1942, all in the Physics Department of the Imperial College : on 6 March, 15 May, 17 July, 18 September and 27 November. Each meeting consisted of an afternoon and an early evening session in order to provide sufficient time for discussion of the lectures, papers and demonstrations. The attendances were very satisfactory, the average being about 50. The titles and authors are given in the pages immediately preceding the Reports of Council in the November 1942 and November 1943 issues of the *Proceedings*.

The inaugural lecture delivered by Dr. W. M. Hampton and eight of the other 1942 lectures and papers have already been, or shortly will be, published in the Society's *Proceedings* (**54,** 391 (1942) ; **55,** 15, 102, 182, 257, 291, 301, 314 and 433 (1943)), and one demonstration has been published in *The Proceedings of the British Society for International Bibliography* (**4,** 25 (1942)). Arrangements have been made for the supply of off-prints of the published papers and discussions to members of the Group.

The membership of the Group on 31 December 1942 was as follows :

Members of the Physical Society	112
Members of other participating bodies	95
Members of twenty-two firms subscribing for sustaining membership	85
Other individual members	11
Total ..	303

REPORT OF THE HONORARY TREASURER FOR THE YEAR ENDED 31 DECEMBER 1942

Presented at the Annual General Meeting, 18 *May* 1943

The excess of income over expenditure was about £649 in December 1942, as compared with £140 a year earlier, the total expenditure being roughly £30 less than in 1941, and the receipts £539 greater. The saving is partly due to the fact that the regulations governing the supply and use of paper did not permit the printing of sufficient copies of Vol. 54 of the *Proceedings* to keep pace with the greatly increased demand, a fact to which reference is made in the Council's Report.

The most satisfactory index of the improvement in the affairs of the Society is to be seen in the increases of income from entrance fees, from members' annual subscriptions, and from sales of the *Reports on Progress in Physics*.

A further publications grant of £200 by the Royal Society from the Rockefeller Foundation Gift is gratefully acknowledged. In due course this will be expended on the reprinting of parts of the 1942 *Proceedings* which are out of print.

The stock of publications, the total value of which has not changed very much, has not been re-assessed. No alteration of the Society's investments was made in 1942, the total market value of which increased by about £180 during the year.

(Signed) CLIFFORD C. PATERSON,

9 *April* 1943. *Honorary Treasurer.*

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31 DECEMBER 1942

1941 £	Expenditure	£ s. d.	£ s. d.
	To		
201	"Science Abstracts"		320 9 10
	Normal Publications:		
1905	"Proceedings"	1512 13 10	
38	Agenda Papers and Notices	46 17 6	
693	"Reports on Progress in Physics"	833 19 10	
			2393 11 2
234	Postage on Publications and General Correspondence		253 12 2
44	Expenses at Meetings		63 17 0
40	Honoraria to Special Lecturers		72 10 0
	Administration Expenses:		
761	Secretarial and Clerical Assistance and Office Expenses	850 10 2	
95	1 Lowther Gardens (including Air Raid Precautions)	87 1 5	
			937 11 7
140	*Balance, being excess of Income over Expenditure, carried forward to Accumulated Fund*		648 12 5
£4151			£4690 4 2

1941 £	Income	£ s. d.	£ s. d.
	By		
	Subscriptions:		
36	Entrance Fees	56 14 0	
1692	Fellows	1756 19 11	
86	Student Members	123 0 6	
23	Colour Group	24 4 0	
—	Optical Group	56 16 0	
112	For "Science Abstracts" and Advance Proofs	114 11 1	
			2132 5 6
	Sales:		
797	"Proceedings"	764 11 8	
616	"Reports on Progress in Physics"	862 13 1	
48	Special Publications	104 13 4	
			1731 18 1
236	Advertisements in "Proceedings"		332 2 2
286	Dividends from Investments		283 18 5
20	Transfer from Life Composition Fund of amounts paid by Fellows now deceased		10 0 0
200	Publications Grant by the Royal Society from the Rockefeller Foundation Gift		200 0 0
£4151			£4690 4 2

BALANCE SHEET AS ON 31 DECEMBER 1942

Liabilities	£ s. d.	£ s. d.
Sundry Creditors		181 12 4
Life Compositions:		
As on 31 December 1941	1481 0 0	
Add Payments during year	63 0 0	
	1544 0 0	
Less Transfer to Income and Expenditure Account	10 0 0	
		1534 0 0
Subscriptions received in advance:		
Members	11 11 0	
Publications	73 2 10	
		84 13 10
Special Funds:		
W. F. Stanley Trust Fund	259 0 0	
Duddell Memorial Trust Fund	369 1 3	
"Progress Reports" Reserve Account	83 1 0	
Herbert Spencer Legacy	239 7 6	
Charles Chree Medal and Prize Fund	1949 9 2	
		2899 18 11
General Fund:		
As on 31 December 1941	4346 19 10	
Add Balance of Income and Expenditure Account	648 12 5	
		4995 12 3
		£9695 17 4

Assets	£ s. d.	£ s. d.
Investments at Market Value on 31 December 1939:		
W. F. Stanley Trust Fund	259 0 0	
Duddell Memorial Fund	374 0 0	
Charles Chree Medal and Prize Fund	1866 10 0	
General Fund	5917 10 0	
		8417 0 0
(Market Value on 31 December 1942: £9830.)		
Dividends due from Investments		54 12 1
Inland Revenue—Income Tax recoverable for 1942		55 10 10
Subscriptions due		67 8 3
Sundry Debtors		205 5 8
Stock of Paper and Binding Material		166 19 9
Cash at Bank	413 17 10	
,, *in Post Office Savings Bank Account*	315 2 11	
		729 0 9
		£9695 17 4

We have audited the above Balance Sheet and have obtained all the information and explanations we have required. We have verified the bank balances and the Investments. In our opinion such Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Society's affairs according to the best of our information and the explanations given to us and as shown by the books of the Society.

Spencer House, South Place, E.C. 2.
6th April 1943.

KNOX, CROPPER & Co.,
Chartered Accountants.

LIFE COMPOSITION FUND ON 31 DECEMBER 1942

	£	s.	d.
28 Fellows paid £10	280	0	0
1 Fellow paid £15	15	0	0
14 Fellows paid £21	294	0	0
30 Fellows paid £31 10s.	945	0	0
	£1534	0	0

SPECIAL FUNDS

W. F. STANLEY TRUST FUND

	£	s.	d.		£	s.	d.
Carried to Balance Sheet	259	0	0	£300 Southern Railway Preferred Ordinary Stock	199	0	0
				£442 Southern Railway Deferred Ordinary Stock	60	0	0
	£259	0	0		£259	0	0

DUDDELL MEMORIAL TRUST FUND

Capital

	£	s.	d.		£	s.	d.
Carried to Balance Sheet	374	0	0	£400 3½% War Loan Inscribed "B" Account	374	0	0

Revenue

	£	s.	d.		£	s.	d.
Honorarium	20	0	0	Balance on 31 December 1941	5	4	9
Medal and Certificate	4	3	6	Interest on War Loan	14	0	0
				Balance carried to Balance Sheet	4	18	9
	£24	3	6		£24	3	6

"PROGRESS REPORTS" RESERVE ACCOUNT

	£	s.	d.		£	s.	d.
Balance carried to Balance Sheet	83	1	0	Balance on 31 December 1941	83	1	0

HERBERT SPENCER LEGACY

	£	s.	d.		£	s.	d.
Balance carried to Balance Sheet	239	7	6	Balance on 31 December 1941	239	7	6

CHARLES CHREE MEDAL AND PRIZE FUND

Capital

	£	s.	d.		£	s.	d.
Balance carried to Balance Sheet	1865	16	4	Balance on 31 December 1941	1865	16	4

Revenue

	£	s.	d.		£	s.	d.
Balance carried to Balance Sheet	83	12	10	Balance on 31 December 1941	14	15	8
				Interest on Investments	68	17	2
	£83	12	10		£83	12	10